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VOL. IX. No. CXCI.] JANUARY 15, 1881. [PRICE FOURPENCE.

THE TELEGRAPHIC JOURNAL AND ELECTRICAL REVIEW.

LONDON: HAUGHTON & COMPANY, 10, PATERNOSTER ROW, E.C.

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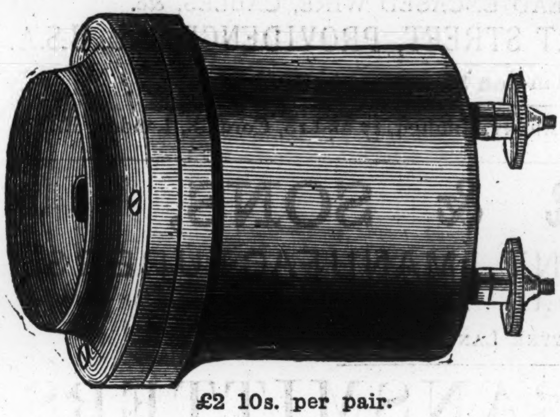

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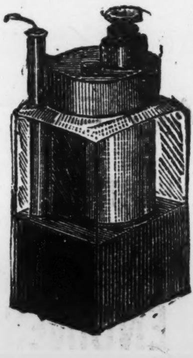

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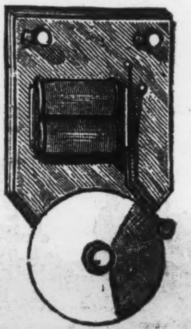

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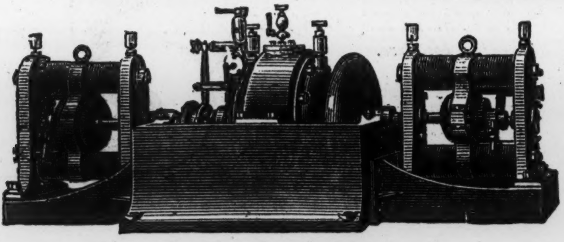

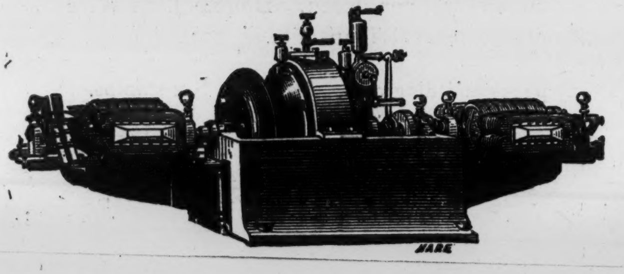

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THE TELEGRAPHIC JOURNAL AND ELECTRICAL REVIEW.

VOL. IX.—No. 191.

THE TELEPHONE AND UNDERGROUND WIRES.

Now that the Postal Telegraph Department have undertaken the opening up of telephonic communication, the use of underground wires is likely to be considerably extended, as it is not probable that the Post Office will follow the example set by the Telephone Company of spinning huge cobwebs in every direction over the metropolis. Up to the present, fortune has favoured the telephone wires; we have had no heavy and continuous falls of snow, with heavy gales, to work havoc overhead, and possibly for the present winter fortune may still continue favourable, although there are still several weeks to be passed during which the trial of strength, or rather weakness, may come, and then the amount of damage in the neighbourhood of Coleman Street and elsewhere may be serious.

It seems unlikely that the bugbear of "induction" between wire and wire can well be overcome as long as the earth is used as the return circuit. The number of new telephones and devices that have been stated to have overcome the difficulty is not a few, but none have really proved effectual. Up to the present the use of a metallic circuit has been the only means of avoiding the evil.

Mr. Brooks, in his system of underground wires which is now on trial between Waterloo Railway Station and Vauxhall, has employed two insulated wires twisted together to form a metallic circuit; a telephone worked on the latter is quite unaffected by heavy working currents passing in neighbouring wires. If the metallic circuit is composed of two wires picked out promiscuously from the number in the pipe, then the effect of induction is strongly felt, as, in consequence of the two wires not occupying the same relative positions amongst the neighbouring circuits, a balance is not obtained. It seems, then, that in order to obtain success, each telephone will have to be worked on a circuit composed of two wires twisted together; but inasmuch as the resistance of a telephone wire may be comparatively high compared with ordinary telegraphic circuits, there is no reason why the two twisted wires should not be contained in a diameter not exceeding that of the present single-conductor gutta-percha underground work. In our opinion this arrangement is the true solution of the difficulty, and inasmuch as it is only applicable in underground work, it is another argument in favour of the latter. The cost, of course, will be slightly greater than that of the single conductor wire; but this is hardly a matter of great consequence. There can be little doubt but that open work in large towns is doomed, and a cheap and thoroughly practical system of buried work, if it can be devised, will hasten its condemnation.

SEYMOUR'S BALANCE GALVANOMETER.

IN the medical world it is seldom that we see accounts of carefully-conducted electrical experiments with numerical values attached; its practice seems to be conducted in the loosest possible manner, anything but calculated to produce successful results. If the latter do occur, it is perhaps more by chance than skill. This is due mainly to the fact that the great bulk of practitioners treat the subject with great indifference. The idea of benefit received being in proportion to the shocking or shaking of the patient, has undergone severe checks, as many unpleasant, and some few serious, results have attended the usual mode of operation. This has led to frequent inquiry for means of regulating and indicating the power given by a battery. The method generally adopted has been to take advantage of the natural divisions of a battery into cells, and to consider the power given by so many cells as a standard measure of force. This has long been seen to be useless and misleading, and led to the placing of a galvanometer in the circuit, which showed by its deflection the current strength. This was a decided improvement, but in practice, for particular purposes, it fails fully to meet the requirements of the electrician who desires to record as exactly as possible an account of his observations.

A simple, effective, and reliable instrument has recently been devised by the electrician to Guy's Hospital, Mr. P. W. Seymour, which seems exactly adapted for the purpose required, and, indeed, for general use. Its novelty consists in the use of the grain as a unit of strength, and the simple manner in which the grain indications have been rendered equivalent to current strength. The instrument is a vertical galvanometer with the advantages of simplicity of construction and manipulation, and also great delicacy, with almost unlimited range of action and thorough reliability. It consists, as shown by the figure, of a pair of ordinary galvanometer coils[*] with the usual magnetic needle. At right angles to this needle, and fixed on the same axis, is a long, thin beam of aluminium, divided on its face into lengths equal to the radius of the circle described by the needle in its oscillation; these divisions are still further graduated into $\frac{1}{10}$ths. Weights of known values can be hung on the aluminium beam, and indicate, on the principle of the steelyard, the amount of force exerted by the current passing through the coils. An index dial is in front of the instrument, and a straw index hand is mounted on the axis of the needle.

---

[*] The left-hand coil is removed in the fig. to show the needle.

It is found best to limit the motions of the needle by stops, and to deflect the former in one direction only; but the stops can be movable by a lever to permit the needle full play, so that it can be used as an ordinary galvanometer.

As the magnetic power of the coils acts upon the poles of the needle, which are practically the extremities, the needle may be regarded as a lever with a force applied at its extremity; hence the divisions of the aluminium beam should be graduated relatively to the radius of the circle it describes.

The magnetic power developed in a helix is directly proportional to the current strength passing through the coils, and the mutual action between a magnet and an electro-magnet are directly proportional to the power of the latter multiplied into the former.

The following sets of figures illustrate the accuracy of the instrument by a comparison of calculated and observed results, the first based on Ohm's Law, $C = \frac{E}{r + R}$. The latter experiments were made with a Leclanché battery newly charged: E.M.F., 1·5; resist., 10; galv. res., 750.

EXPERIMENT I.

NUMBER OF CELLS.	CALCULATED RESULTS.	OBSERVED RESULTS.	
		Grains of force.	Relative values.
1 cell	1·97	·468	1·872
2 „	3·89	·962	3·848
3 „	5·76	1·375	5·5
4 „	7·55	1·875	7·5
5 „	9·37	2·312	9·248
10 „	17·64	4·335	17·5
15 „	25·	6·25	25·
20 „	31·57	7·875	31·5
25 „	37·5	9.312	37·248
30 „	42·85	10·625	42·5

This is not an isolated experiment, but one taken from several hundreds of a similar kind, and the figures are sufficiently near for all practical purposes; and there can be no doubt, as these were obtained with a comparatively roughly-constructed instrument, that if necessary a nearer approach to calculated results may be secured by giving greater attention to the mode of suspending the needle and beam. Mr. Seymour says he can measure to the $\frac{1}{100}$th part of a grain, which is equal to the $\frac{1}{50}$th part of the force given by a single Leclanché cell, and he considers increased delicacy no practical advantage, unless for special purposes of investigating small forces.

The following set of figures are tests of the various cells in a 30-cell battery, joined up in series, and gives an idea of grain and cell value from a Leclanché battery in fair working condition, the range being from the fraction of a grain to about 11 grains :—

EXPERIMENT II.

Cells tested.	Force in grains.	Cells tested.	Force in grains.	Cells tested.	Force in grains.
1 to 5	2·312	1 to 10	4·375	1 to 15	6·25
5 „ 10	2·312	5 „ 15	4·375	5 „ 20	6·25
10 „ 15	2·312	10 „ 20	4·375	10 „ 25	6·25
15 „ 20	2·312	15 „ 25	4·375	15 „ 30	6·25
20 „ 25	2·312	20 „ 30	4·375		
25 „ 30	2·312				

Cells tested.	Force in grains.	Cells tested.	Force in grains.
1 to 20	7·875	1 to 25	9·312
5 „ 25	7·875	5 „ 30	9·312
10 „ 30	7·875	1 „ 30	10·625

This grain-value refers only to current strength direct from the battery. If the patient be placed in circuit, of course the increased resistance materially diminishes the current.

EXPERIMENT III.

5 cells ranging from ·02 to ·08 grains.
10 „ „ ·1 „ ·2 „
15 „ „ ·2 „ ·3 „
And so on to about ·75 or 1 grain.

The uniform value of each series, as shown in the second series of experiments, is not the rule even with new batteries, for it can only be secured by care in testing each cell, and rejecting those which do not come up to a given standard. The carelessness of workmen causes cells to be imperfectly charged or otherwise defective, and these, inserted among good ones, seriously deteriorate the value of the battery power as a whole. The following, show tests of a battery with defective cells :—

EXPERIMENT IV.

Cells tested.	Force in grains.	Cells tested.	Force in grains.	Cells tested.	Force in grains.
1 to 5	1·65	1 to 10	3·1	1 to 15	3·9
5 „ 10	1·7	5 „ 15	3·1	5 „ 20	3·9
10 „ 15	1·9	10 „ 20	4·	10 „ 25	4·94
15 „ 20	2·	15 „ 25	4·5	15 „ 30	6·3
20 „ 25	2·4	20 „ 30	4·6		
25 „ 30	2·45				

Cells tested.	Force in grains.	Cells tested.	Force in grains.
1 to 20	5·5	1 to 25	5·15
5 „ 25	5·25	5 „ 30	5·2
10 „ 30	8·	1 „ 30	5·35

After testing each cell, and weeding out two very bad ones, the following values were given, which shows great improvement in the battery power :—

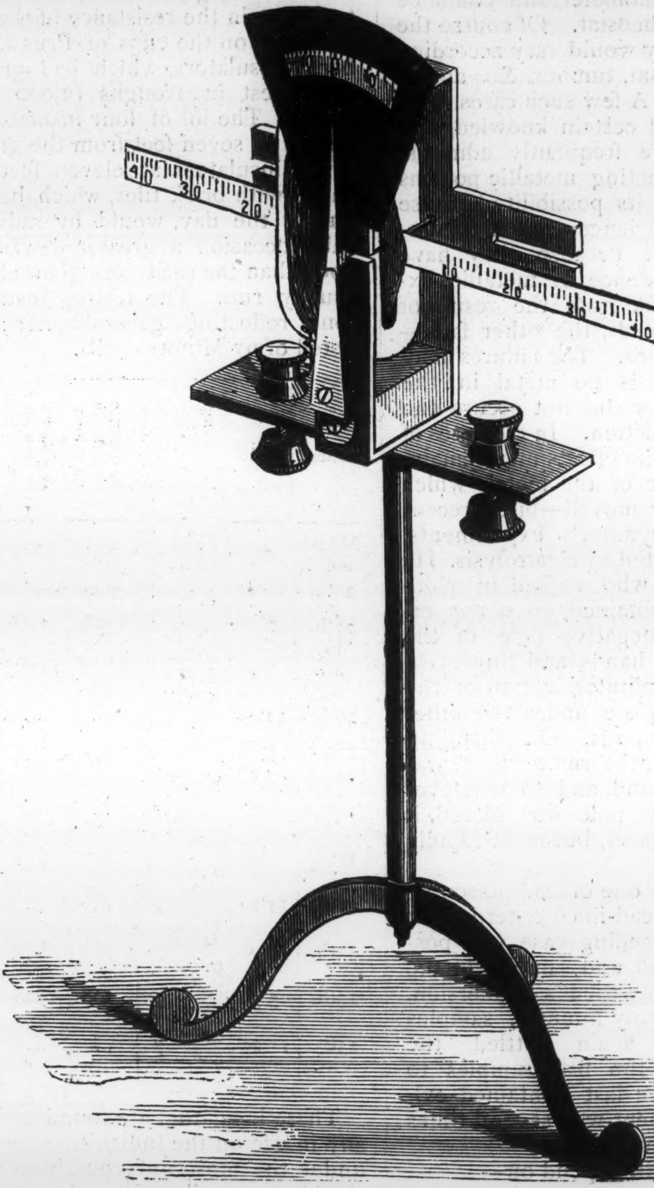
EXPERIMENT V.

Cells tested.	Force in grains.	Cells tested.	Force in grains.	Cells tested.	Force in grains.
1 to 5	1·65	1 to 10	3·3	1 to 15	4·63
5 „ 10	2·1	5 „ 15	4·2	5 „ 20	5·95
10 „ 15	2·25	10 „ 20	4·5	10 „ 25	6·30
15 „ 20	2·4	15 „ 25	4·8		
20 „ 25	2·4				

Cells tested.	Force in grains,	Cells tested,	Force in grains.
1 to 20	6·40	1 to 25	7·42
5 „ 25	7·65	1 „ 28	8·55

The last two sets of figures plainly show the uselessness of reckoning the power by cells, for in set 1 to 15 (Ex. 4)= 3·9, and the last in same series 15 to 30 = 6·3, a difference of 2·4 grains, or quite 5 good cells—a result constantly met with even in the ordinary wear of a battery, for the first series, being most often used, are the first to exhaust.

In practice this irregular wear of the battery, although at first sight a disadvantage, affords really a positive benefit, as it supplies the operator with a variety of graduations of battery power.



With this simple instrument physicians and surgeons have now a trustworthy basis for their future investigations, enabling them to be as precise in their electrical prescriptions as with any other remedy, and ere long we may expect to see specified the exact direction and current strength of electricity, with due regard to frequency and duration of application, and by a careful compilation and comparison of results attending this enlightened use, more will be done to define the true value and sphere of usefulness of this force than all the past loose and necessarily unreliable experience.

It is interesting to know the many ways in which such an instrument can be rendered serviceable to the medical electrician. Among others, cases of aneurism, cancer, tumurus, &c., have been frequently submitted to the electrolytic action of the battery to effect relief or cure. Those who have had much to do with the electrolysis of various solutions are fully aware of the importance of fitting, as it were, the battery to the work; slight excess, diminution, or fluctuation materially alters the character of the results, the great desideratum being—

1st.—The right strength of current.
2nd.—To maintain it uniform.
3rd.—The duration of the application.

These must at least be as important in electrolytic surgical cases, but what that strength of current is which proves most satisfactory and successful has not yet been settled, probably because "so many cells" has been the usual explanation of the strength used, and may possibly account for the fact that while success attended some, failure came to others. With this new galvanometer, and a rheostat in circuit, the current can be measured off to the $\frac{1}{100}$th part of a grain, or the $\frac{1}{50}$th part of a single cell, and the slightest fluctuations of current would be noted by the galvanometer, and could be instantly corrected by the rheostat. Of course the strength of current necessary would vary according to whether it be an aneurism, tumour, &c., and to the character of the latter. A few such cases, with measured doses, would afford certain knowledge.

Electro-galvanic baths are frequently administered with the object of extracting metallic poisons from the body. Some deny its possibility because they have not in their experience seen it accomplished. Others believe it because they have succeeded in obtaining evidence of metallic extractions. Both sides speak from the result of direct experiment—one succeeds, the other fails—hence the opposite conclusions. The failures may result either because there is no metal in the patients, or else the operator did not secure the proper conditions for its extraction. In old cases of lead or mercury poisoning, the effects may remain, without the actual presence of the metal, which nature or medicine may have removed—but in recent cases, according to Mr. Seymour's experiments, metals are successfully extracted by electrolysis. He mentions one case of a man who worked in white lead works, from whom he obtained, on a copper-plate connected with the negative pole of the battery, the outline of the hands and fingers in deposits of lead after ten minutes' action of the battery, while the positive plate under the other hand was free from any deposit. On changing the direction of the current, the same effect was produced from the other hand, and to whatever part of the body the negative pole was placed, it became covered with this deposit, but most rapidly from the hands and arms.

Another case he refers to is one of lead poisoning from drinking water from a lead-lined cistern. No such evidence as in the preceding case was possible, but a bath was prepared, and samples of the water bottled off before the patient's immersion. After being bathed for twenty minutes, samples of the bath water were again bottled, the results of analysis showing the first samples to be free from lead, while the last contained evidences of lead. The experiment was several times repeated with the same care and results.

Success with these cases will depend on—

1st.—The preparation of a bath capable of receiving the metallic salt in solution.

2nd.—The strength of current necessary to effect its dissolution.

3rd.—To place the patient in contact with the right pole of the battery.

To secure the first—If gold, silver, or mercury are the metals to be extracted, a bath must be made of acid hydrochloric, 1 oz. to every gallon.

If lead, then use for the bath acid sulphuric, 1 oz. to each gallon; from twenty to thirty minutes' immersion is quite sufficient. Occasional interruptions of the current, so as to produce muscular contractions, prove serviceable during the bath.

RESISTANCE OF DEW ON THE SURFACES OF INSULATORS.

The following tests were taken in Madras in 1877 to ascertain the resistance of the deposit at night of moisture on the cups of Prussian pattern (Schomberg) insulators, which had previously passed the usual test in troughs (2,000 megohms each at least). The lot of four insulators was placed at a height of seven feet from the ground and the lot of seven insulators at eleven feet. The yard being paved with brick tiles, which became much heated during the day, would by radiation at night probably occasion a greater dewfall in its neighbourhood than the roads and fields along which the lines usually run. The testing instrument was Thomson's reflecting galvanometer; the battery consisted of 97 Minotto cells.

Date.	Time.	Temp. F. $\frac{\text{Wet.}}{\text{Dry.}}$	Number of Insulators.	Resistance absolute in megohms.	Resistance per insulator in megohms.	Remarks on weather.
March 20th.	5·30	$\frac{74^\circ}{76^\circ}$	4	157·5	630	Before sunrise. Fair. Clouds at night.
20th.	12·0	...	4	14608	58432	Sun shining.
27th.	6·0	$\frac{75^\circ}{78^\circ}$	4	504	2016	Before sunrise. Fair. Clouds at night.
May 9th.	5·45	$\frac{80^\circ}{83^\circ}$	7	145·9	1021·3	Moderate dewfall. Slight clouds.
10th	12·0	$\frac{80^\circ}{90^\circ}$	7	...	...	Sun shining.
11th.	5·40	$\frac{79^\circ}{82^\circ}$	7	115·6	809·2	Slight dew. Scattered clouds.
11th.	12·20	$\frac{83^\circ}{91^\circ}$	7	...	...	Sun shining.
12th.	5·30	$\frac{80^\circ}{83^\circ}$	7	25·6	179·2	Rather heavy dew-clouds.
12th.	14·20	$\frac{84^\circ}{91^\circ}$	7	...	...	Sun shining.
13th.	14·0	$\frac{84^\circ}{91^\circ}$	7	150·1	1051	While water was being poured over them from above.
15th.	5·30	$\frac{75^\circ}{79^\circ}$	7	.100	700	Clear sky. No wind.
15th.	11·20	$\frac{77^\circ}{90^\circ}$	7	...	...	Sky overcast.

These insulators are found to be as efficient as any in use on the Indian lines, ensuring as they do, under the most unfavourable circumstances, a resistance per mile of not less than two megohms. (The lowest result above obtained, viz., 25·6 for seven insulators, gives for a mile of twenty insulators 8·9 megohms.) They have been in use for nine or ten years on the through line from Madras to Bombay—eight hundred miles, and have been with excellent effects lately introduced on the main wire from Madras to Calcutta for about eight hundred miles of its length. Though very variable in amount in India, dew is not to be feared as an impediment to communication in the absence of dirt, webs, cracked insulators, and true contacts.

AN IMPROVED TELEPHONE.

By W. E. FEIN, STUTTGART.

IN the construction of the telephone to be described the electro-magnet is not as usual manufactured of solid iron, but is composed of a large number of well insulated thin iron plates or iron wires. By this arrangement the electro-magnet changes its magnetism very quickly, so that the inducting effect is very considerable. The shape of the electro-magnet too is different from that generally adopted; the lateral section is segmental, producing thereby a uniform central attraction at the diaphragm, which greatly increases the purity of the sounds. The segment-shaped armatures are further surrounded by semi-circular coils, the given space thus being completely made use of and allowing the coils being wound with a wire of the greatest possible length; these telephones may in consequence be used for working over great distances or through high resistances.

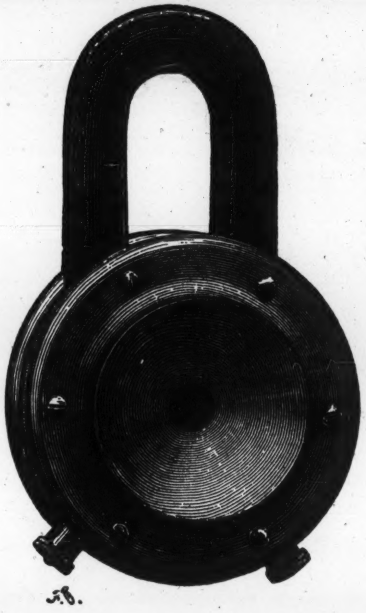


FIG. 1.

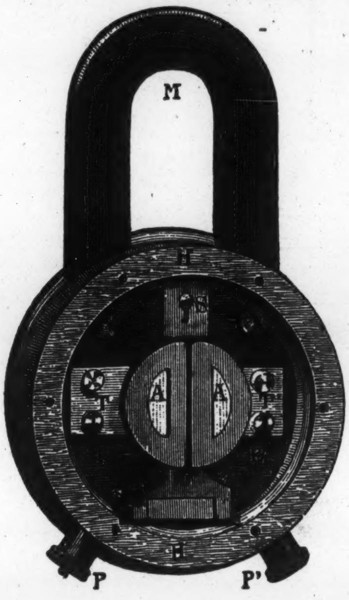


FIG. 2.

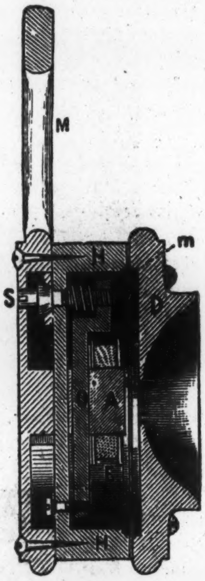


FIG. 3.

The improved telephone requires no special alarm or signal apparatus, the sound of a small reed or whistle being sufficient to produce a distinctly audible signal at the station to be called.

Fig. 1 shows the external view of the telephone one-third actual size; fig. 2 shows the internal arrangements, with speaking-funnel and membrane screwed off; fig. 3 is a section of the same.

The horseshoe steel magnet, M, has its poles mounted with the armatures, T and T^2, its bent portion projecting out of the wood box, H; this projecting part may conveniently be used as a handle. The size and shape of the magnet has a favourable influence on the production of a strong magnetic force, and therefore on the efficaciousness of the telephone. The centre of the segment-shaped electro-magnets is in the same line with that of the diaphragm.

By this arrangement the attraction of the diaphragm is quite uniform, and its vibrations regular; the sounds of speech are transmitted clearly and distinctly.

The electro-magnets, composed of iron plates or wires, are surrounded by the coils, E and E^1, the distance between these two being regulated by a special contrivance. Between the two bars of the steel magnet the brass lever, O, is placed; this lever is movable on one end, between two screw points; at the other end it is kept in position by the screw, S, by turning which the lever is made to move up or down; a strong spiral spring prevents any end play of the screw; the head of this screw passes through the back plate of the instruments, and can be turned by a screw-driver. The two electro-magnets are screwed on to the lever, O, and their distance from the diaphragm may be varied without altering the position of the steel magnet. The wire ends of the coils are joined to the two terminals, P and P^1, to which are connected the conducting wires.

THE TELEPHONE CASE.—We hear that as yet no notice of appeal against the judgment in this case has been given. It seems probable that no appeal will be made.

TELEGRAPHIC APPARATUS IN USE IN THE BRITISH POSTAL TELEGRAPH DEPARTMENT.

XXV.

THE WHEATSTONE AUTOMATIC SYSTEM.

(Continued.)

THE RECEIVER.

BEFORE considering the local connections of the "Transmitter," it will be convenient to refer to the general arrangement of the "Receiver." The electro-magnet which works the recording arrangement in the Wheatstone Receiver is exactly similar to that in the Post Office standard relay (Article V., March 15th, 1880), and, as in the latter instrument, there are two soft iron tongues, fixed on an axis, and polarised by a permanent D-shaped magnet. This permanent magnet is shown by M, Fig. 99; F, F_1, show the soft iron tongues, which latter play between the poles of the electro-magnets.

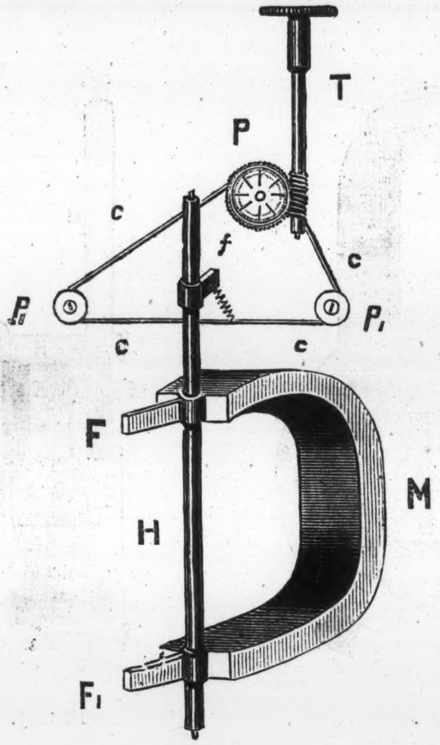


FIG. 99.

Midway between the tongue, F, and the top of the axle, H, is fixed a small tongue, *f*, to the end of which is fixed one extremity of a small spiral spring; the other end of the latter is attached to a link in a fusee chain, *c*, *c*; this chain passes under two pulleys, p_1, p_1, and also over and around a third pulley, P, in whose edge teeth are cut. Into the teeth in P a screw, cut on the fingerscrew, T, gears; by turning the latter the pulley, P, is rotated, and the fusee chain, *c*, *c*, moved round to the right or left. If the lower end of the spring is drawn by the chain to a position exactly under the end of the tongue, *f*, then the tongues, F, F_1, on the axle H, have no bias either to the right or to the left; if however, by turning the fingerscrew, T, the end of the spring be drawn either to the right or left, then a corresponding bias, due to the tension of the spring, will be imparted to the tongues, and their movements can thus be regulated. The front of the pulley, P, is graduated, and a small index pointer, *n* (shown in fig. 101) is fixed close to the graduations, by means of which the regulation can be adjusted to any degree. It is seldom, if ever the case, however, that these divisions are made use of or referred to.

From fig. 100 (in which fig. the small tongue, *f*, is omitted) it will be seen that at the top of the axle-H, a long bent tongue, J, is fixed, turned in the same direction as the tongue, F. At the bent end of this tongue a hole, J_1, is drilled, through which the axle, A, passes; a portion of the metal on the right hand side of the hole, J_1, is filed away, so that the side of the axle, A, projects slightly; the latter is kept in its place by means of a spring, *z*, *z*, whose end is screwed to J.

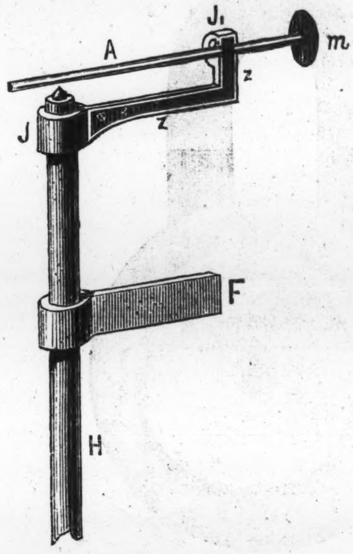


FIG. 100.

At the end of the axle, A, the small wheel, *m*, is fixed, which corresponds to the inking disc in the Direct Writer instrument (Article IV., March 1st). The paper slip, upon which marks are made by the wheel in being pressed against it, moves in close proximity to the latter, as will be seen in fig. 101, where *m* is shown by dotted lines.

The wheel, *m* (fig. 101), has its circumference in close proximity to a large disc, *d*, the lower part of which dips into an ink-well, I. Both *m* and *d* are kept rotating by means of the same train of clock-work which draws forward the paper slip. The rotation of *d* in the ink-well causes its periphery to be continually coated with ink, and *m* being in close proximity to *d*, the former takes up ink from the latter, and thus itself has its periphery kept continually wetted with the ink, and ready to mark the paper slip when pressed against it.

Referring to fig. 101, it will be seen that the paper slip passes between two rollers, Q, Q_1, the

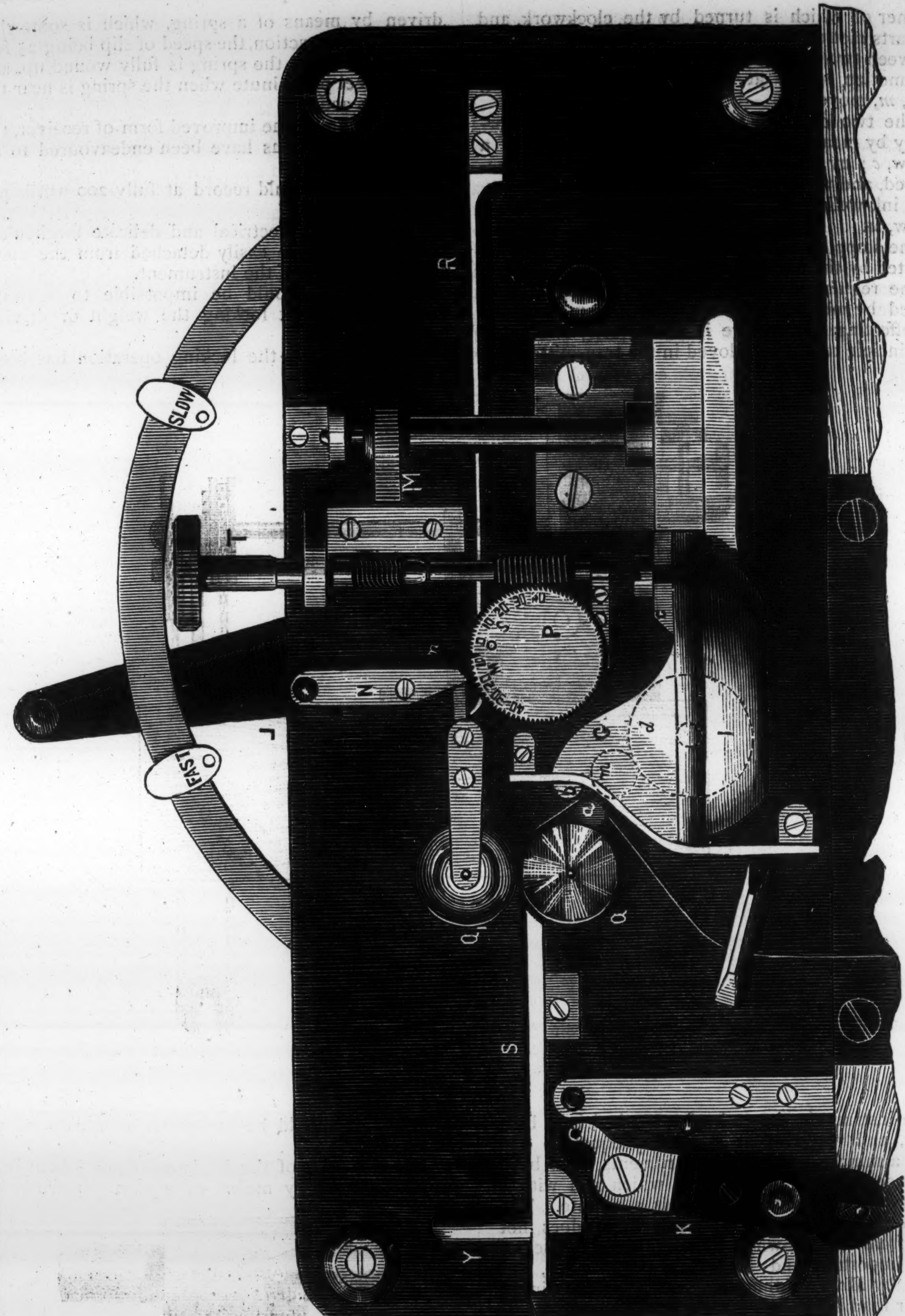


FIG. 101.

former of which is turned by the clockwork, and imparts motion to the slip. The paper also passes between two projecting pieces, *a* and *b*, which keeps its motion steady at the point where the inking disc, *m*, moves.

The two discs, *m* and *d*, are covered over normally by means of a hood, G, fixed by means of a screw, *c*; by unscrewing the latter, G can be removed, and the discs, *m* and *d*, got at if necessary. The ink-well is secured in its place by the thumbscrew, M.

The stopping and starting of the clockwork is effected by the hand-lever, K.

The regulation of the speed of running is controlled by means of the lever, L; the mechanism for effecting the change in the velocity is similar in principle to that employed in the transmitter.

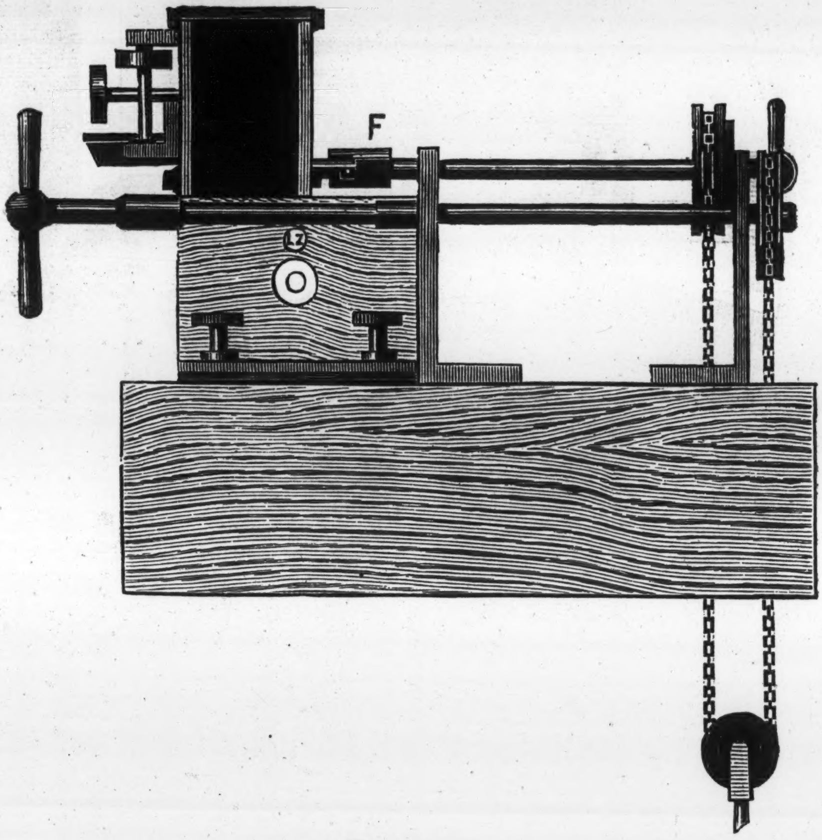


FIG. 102.

The instrument shown by fig. 101 is driven by a spring, and will run at a velocity equal to 120 words a minute. Recently instruments have been introduced, driven by a weight, which run with a velocity equal to over 200 words a minute. The general mechanism of this instrument does not differ from that shown in fig. 101, but it possesses some important and ingenious peculiarities, designed by Mr. J. Willmot, and described by him in a paper read before the Society of Telegraph Engineers, as follows:—

"The improved form of receiver has been designed to meet the increasing requirements of the postal telegraph service, to secure a higher rate of speed.

"The present form of Wheatstone's Receiver is driven by means of a spring, which is somewhat irregular in its action, the speed of slip being 25 feet per minute when the spring is fully wound up, and only 19 feet per minute when the spring is near the end of its action.

"In designing the improved form of receiver, the following conditions have been endeavoured to be fulfilled:—

"1. That it should record at fully 200 words per minute.

"2. That the electrical and delicate mechanical portions should be easily detached from the more substantial parts of the instrument.

"3. That it should be impossible to separate them without first locking the weight or driving portion.

"4. That when the locking operation has been performed, it should be impossible to accidentally release it.

"The two parts of the instrument are joined or geared together by means of a joint constructed upon that known as the bayonet principle, and the action of the weight is to keep the flat surface of the joint pressing against the pin, A (fig. 103). The two portions of the instrument cannot, therefore,

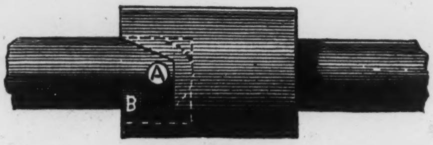


FIG. 103.

be separated, on account of the projecting part, B, of the socket preventing the withdrawal of the pin referred to.

"Referring to fig. 104 (representing the locking gear), it will be seen that the click wheel and 'pawl' are rather peculiar in shape, and that when the 'pawl' is placed in gear with the wheel it becomes locked, on account of the teeth of the wheel being undercut.

"To separate one portion of the instrument from the other, it is necessary to raise the 'pawl,' E, until it passes its central position; the spring, C, then comes into operation, and presses the 'pawl' against the click wheel, D. By this means the weight is brought to a standstill, and is securely locked until the click wheel is turned (by means of a handle fixed at the right-hand end of the axle carrying the socket, F, fig. 102) into such a position as to permit of the 'pawl' being easily disengaged.

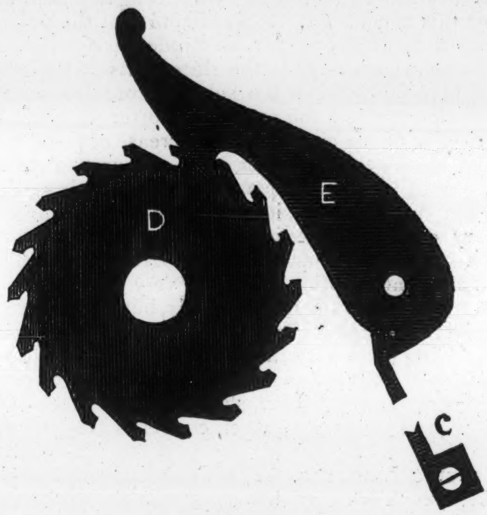


FIG. 104.

"When the weight has been brought to a state of rest (as already described), the pin, A, is carried forward, by reason of the momentum acquired by the trainwork, into the position shown in fig. 103. The parts can now be easily separated.

The instrument has been worked upon a London and Liverpool circuit at a speed of 250 words per minute.

"It is intended that that portion of the instrument comprising the paper draws, weight, &c., shall be permanently fixed in the operating rooms, and that the smaller portion, containing the more intricate parts, should only be sent between the workshops in London and the various telegraph stations throughout the country."

Reviews.

Tratado de Telegrafia. Par DON ANTONINO SUAREZ-SAAVEDRA, licenciado en ciencias exactas. Segunda edicion. Tome I.: *Historia Universal de la Telegrafia.* JAIME JEPUS, Barcelona.

THIS is a well got-up book, and reflects credit upon the author, and is a good addition to the scientific literature of Spain, which is not over rich in books dealing with telegraphy. We know of no work which deals so fully with the very early history of telegraphy, that is to say with the period at which the *electric* telegraph was not thought of.

The chapter on batteries describes all the well-known forms, and also numerous modifications which are not employed to any great extent, but which form links in the chain of this branch of the subject. Evidently every available source has been ransacked to obtain information, and this has been done in an exhaustive, though concise manner, highly creditable to the author. This careful search into the existing literature on the telegraph is a marked feature in the book, and has enabled the author to give an immense amount of information, though this has been done without making an unwieldy volume.

A great fault in the work is a want of illustrations, which are far too few to make the explanations intelligible, but to have illustrated to the necessary extent would probably have added too much to the cost of the book, the circulation of which must necessarily be limited.

We must add that the work is carried well up to date.

Les Telegraphes Par A. L. TERNANT. Hachette et Cie., Paris.

THIS is an excellent little work, well got-up and well illustrated. Forsaking the usual order of things, M. Ternant places the telephone first in describing the electric telegraph. The first chapter gives a description of the heliograph. This, we believe, is the first description of this instrument in any book on telegraphy.

Chapter III. deals with the pneumatic tube system, which is fully and clearly described.

The construction and laying of cables is very completely gone into, illustrations of the machinery for manufacturing the cable, both core and sheathing, being given The arrangement of the paying out gear is also described and illustrated in a very satisfactory manner; in fact, the book of M. Ternant's is the only one we know of where the mechanical branch of submarine telegraphy is dealt with.

Although the chapters on the telegraph instruments are not long, a wonderful amount of excellently illustrated matter is given, all well up to date.

The description of the duplex system shows very completely the arrangements both for land lines and submarine cable, Muirhead's artificial cables being explained.

The chief fault we have to find with the work is that there is not enough of it. M. Ternant is, we are sure, capable of greater things, and it is to be hoped that he will bring out at some future date an enlarged edition of this book; in the meantime, we wish the latter the success which it thoroughly deserves.

La Telescopie Electrique. Bassée sur l'emploi du selenium. Par ADRIANO DU PAVIA. José da Silva, Porto.

THE object of this *brochure*, as set forth in the preface, is to obtain a public opinion upon the priority of a certain scientific question, this question being the invention of an electrical telescope, based upon the variation of the resistance of selenium by the action of light. The author has formed certain ideas from which he theoretically forms the invention in question; but these ideas he has never put into practical shape. We think it is going rather far to claim the invention of an instrument upon such imperfect and unmatured theories.

Book Received.

Telegraphic Tales and Telegraphic History. By W. J. JOHNSTON, New York.

Notes.

SIEMEN BROTHERS AND COMPANY, LIMITED.—We have been favoured with a copy of a circular, issued by Messrs. Siemens Bros., in which it is stated that the firm have incorporated themselves mainly with a view of taking advantage of the provisions of the Companies' Acts, and that the three partners of the firm of Siemens Brothers will continue to hold the bulk of the capital of the new company, and that the board of the new company, will be constituted as follows: Dr. C. William Siemens, chairman; Dr. Ernst Werner Siemens, Mr. Carl Heinrich Siemens; Mr. L. Loeffler, managing director.

M. A. BARTOLI has recently investigated the laws of galvanic polarisation. On measuring the polarisation of the single electrodes in different solutions the author finds that the polarisation of the positive electrode is equal to that of the same electrode when used as a negative pole, as long as the polarisation is far from its maximum. When near the maximum the polarisation of the negative electrode is somewhat greater in solutions of hydrobromic or hydriodic acid, equal for both electrodes in water and hydrochloric acid; in bromiferous hydrobromic acid and iodiferous hydriodic acid the polarisation of the positive electrode is naturally much greater. In case of copper and silver electrodes in dilute sulphuric acid the polarisation by oxygen disappears almost entirely.—*Wiedemann's Beiblätter.*

PROF. BLYTH has constructed an electric sonometer, consisting of a wire monochord, which, traversed by an interrupted electric current, was set into strong vibrations between the poles of a horse-shoe magnet. The notes given out were loudest when they were harmonics of the fundamental interrupted note which was sounded by a vibrating tuning-fork inserted in the circuit.

EXPERIMENTAL RESEARCHES ON FEEBLY MAGNETIC BODIES.—By H. Silez.—The author concludes that with an increase of separative power the magnetising function of a solution of ferric chloride first increases and then again declines, as with iron itself.—*Wiedemann's Beiblätter.*

THE Postal Department of Switzerland is authorised to establish a system of telephonic communications at Bâle, where 62 subscribers have been already obtained. The department is also authorised to establish telephones in any towns where the number of subscribers is sufficient.

FROM some experiments made by M. Mercadier it seems almost conclusively proved that the effects observed in Professor Bell's photophone are due to heat only. Receiving discs were tried which were coated with silver on the side next the light: the effects were feeble. When coated with absorbent lamp-black the effects were strong.

ON ELECTRIC POLARISATION BY METALLIC PRECIPITATES.—D. Macaluso.—According to Lippmann the polarisation of a negative metallic-electrode in a solution of another metal is perceptible, but disappears on adding a small quantity of a salt containing the metal of the electrode. Macaluso has arranged experiments to test this conclusion. It was found that the polarisation of a negative copper electrode in a solution of zinc sulphate, contrary to the statements of Lippmann, is still perceptible when the solution contains traces of blue vitriol, and this the more the shorter the time since interruption of the circuit. This decrease of polarisation in time is also observed in case of pure solution of zinc. With very small quantities of polarising electricity the polarisation immediately on opening the primary current decreases at first rapidly and then slowly. With larger quantities of electricity the polarisation after interruption decreases very slowly for some minutes and then falls more quickly, but again becomes slow as it approaches zero. With an increasing quantity of polarising electricity the polarisation rises to about 0·92 Daniell. With an increasing proportion of copper the polarisation rises more slowly with the increase of the primary current than when copper is absent.

ELECTRIC LIGHTING.—The Commissioner of Public Works, New York City, has granted Mr. Edison a permit to introduce his system of electric lighting in the lower part of this city.

IT is intended to light the St. Gothard Tunnel by the electric light, the machines supplying the current being worked by the turbines at Airolo and Goeschenen.

GALVANIC EXPANSION.—M. A. Righi finds that if a mirror capable of revolving is fixed at the end of a wire, 1 to 7m.m. in thickness and 1·5m. in length, it does not move suddenly if the current of 1 to 6 Bunsen elements is suddenly passed and again interrupted, though the apparatus would have rendered a change of length of $\frac{1}{20000}$ m.m. perceptible. The length of the wire is gradually affected by the evolution of heat.

THE MELBOURNE EXHIBITION.—The collection of telegraphic apparatus exhibited in the British Court of this Exhibition is of a very satisfactory character. The Telegraph Construction and Maintenance Company exhibit a collection of cables. Messrs. M. Theiler and Sons exhibit an interesting and varied collection of apparatus, including ordinary telegraphic instruments and also block-signalling apparatus of every variety manufactured by this well-known firm.

THE THERMIC OR GALVANOMETRIC LAWS OF THE SPARKS IN INDUCTIVE DISCHARGES.—E. Villari.—In short sparks the development of heat is approximately proportional to the length. In those of a medium length there appears scarcely any connection, and in very long sparks the heat rapidly decreases.—*Wiedemann's Beiblätter.*

IN the month of August the president of the Institute of Civil Engineers received official intimation from the

Privy Council Office that a petition had been presented to the Queen in Council for the grant of a Royal Charter of Incorporation to the Society of Telegraph Engineers, and the President's opinion was invited as to whether the provisions contained in the draft charter were such as to interfere in any way with the rights and privileges of this Institution. As in the unanimous opinion of the Council no just or sufficient reasons existed for the grant of a second charter within the same profession, they embodied their objections to such a proceeding in a letter, a copy of which is given in the annual report of the Institute. The action of the Council did not arise from any want of friendly feeling towards the Society of Telegraph Engineers, inasmuch as the Institution had always shown a readiness and a desire to promote the welfare and prosperity of that Society; but the Council submit that it is neither expedient nor advisable that any society, having like objects with those which the Council believe have been faithfully and honestly carried out by the Institution of Civil Engineers, should be incorporated by Royal Charter.

YVON ZOCH has described a new kind of electric dust-figures, which he regards as having an important bearing upon the theory of discharges in vacua, being in opposition to the views of Crookes. Tubes of 1 to 3 centims. diameter, and from 10 to 30 centims. in length, were closed at both ends by corks pierced to receive copper wires. In the tubes were placed various powders, bronze powder being chiefly used in preference to others, which being lighter, adhered to the sides of the tube. One wire was then connected with the positive conductor of an electric machine; from the other the repelled electricity dissipated itself into the air. In other cases the discharges of Leyden jars were employed. The experiments were all conducted at atmospheric pressure. When thus treated the bronze powder arranged itself in beautifully-marked ridges of strata, varying in regularity according to the original distribution of the powder. A space free from all traces of powder was observed to surround the positive pole. Usually there was a corresponding accumulation about the negative pole. These ridges or striations may be compared to the stratifications observable in Geissler-tubes; and Herr Zoch shows that variations in the strength of the electric discharges, in the width of the tubes, &c., produce upon these figures similar effects to those they produce on the luminous striæ of vacuous tubes. In this present case a mechanical repulsion of the particles lying near the poles undoubtedly takes place; and the author of this research believes that the presence of light at the poles of the Geissler tube may be similarly accounted for on the hypothesis that the luminous regions are those of less density than the non-luminous. Since the bronze powder is heaped up mostly about the negative pole the inference is that at the negative pole of a Geissler tube the residual gas has a greater density than at any other part. The stratifications produced by electric discharges through flames may be similarly explained; and these researches have an obvious bearing on the structure of Lichtenberg's well-known figures.—*Nature*.

THE RADIANT MATTER OF THE ELECTRODES.—M. J. Puluj shows that most of the phenomena observed by Crookes had been previously described by Hittorf. He does not accept the view of Crookes on a fourth state of aggregation. The author shows, further, that the thickness of the dark space is not determined by the mere length of the passage of the molecules. A plate-shaped cathode was fixed in the midst of a cylindrical tube, and the thickness of the dark space, d, was measured at various pressures, p; if it had been proportional to the mean transit, p, d, would be constant, since the mean length of transit would diminish proportional to the pressure, but this is not the case.

For air, the mean length, l, is at $p =$ 0·06m.m., $l =$ 0·9; if $p =$ 1·46m.m., $l =$ 0·04, so that there is no agreement between l and d.

The author has also seen the green light at far higher tensions (0·04) than Crookes (0·00076m.m.). He ascribes the cause of the phenomena to metallic particles, charged with electricity and thrown off by the electrode. These strike against the sides of the tube. He shows by the manner in which they are deposited upon the side that these particles are repelled by the magnet. That no deposit appears on the sides in case of aluminium electrodes he explains by the adhesive relations of this metal to glass. He has also examined in some bodies the phosphorescent light under the influence of the rays of the cathode, and with a blue emerald he has, like Crookes, obtained a splendid crimson colour. Carbonised paper, after being heated for some time to whiteness by the action of the rays of the cathode, showed a phosphorescence, possibly due to microscopic diamonds. If disc-shaped electrodes are used, the discharge passes from them at very low tensions to and along the side, as was shown by means of a magnet. The exterior became strongly electro-positive. If the tube has been so far exhausted that the phosphorescence appears faint, and only the faint blue clouds of the cathode rays are to be seen, they disappear if the tube is touched at the negative electrode at the side farthest from the positive pole, and the tube becomes brilliantly phosphorescent. A touch elsewhere is without effect. Bodies placed within highly-exhausted tubes become strongly electric under the influence of the rays of the cathode. According to Hittorf and Goldstein this phosphorescence is due to rays of high refrangibility. In order to refute this supposition, the author interposed a plate of quartz through which the ultra-violet rays would pass; nevertheless the cathodic rays were completely intercepted. The author explains the phosphorescence by assuming that the ether, free from particles of the electrodes, and carried along as electricity, seeks an exchange with that enveloping the molecules of matter upon which it infringes, and thus gives rise to vibrations. In case of a rectilineal electrode repeatedly twisted, the author, like Goldstein, observed in the phosphorescent light an alteration of dark and bright phosphorescent lines. The decrease of phosphorescence which Crookes observed in places which had been struck by the discharge for some time, Puluj seeks to explain by assuming that it has become coated with a metallic layer of the matter of the electrodes. Carbon, heated in the centre of the cathodic rays, yields a very bright white light, and may possibly be used as an electric light. The author explains the deflection of the cathodic rays by the magnet by regarding the escaping particles, charged with electricity, as elementary currents, to which the law of Laplace may be applied, as has already been done for the explanation of the phenomena observed by Plücker at the negative pole.—*Wiedemann's Beiblätter*.

ELECTRIC LIGHTS IN BROADWAY, NEW YORK.—Last year the New York Board of Aldermen passed a resolution requesting the Gas Commission to cause experiments to be made with electric lights, with a view to testing their adaptability for lighting streets, avenues, parks, and squares. No action was taken by the commission until recently, when permission was granted to the Brush Electric Light Company to test their system at their own expense on Broadway, from 14th to 34th Street, a distance of a mile. The posts for the

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new lamps are now being set up, and it is promised that the lights will be in operation by Christmas. The iron lamp posts are twenty feet high from the base to the foot of the lamp. Their upper portions are supplied with projecting teeth, which are intended to be used as steps by the men assigned to keep the lamps in good condition. The lamps are constructed in accordance with the Brush patent, being from four to five feet in height and surmounted with an iron hood.

The whole number of lamps will be twenty-two; the wires will be carried from the top of one post to the top of the next for the present, or until the city decides to adopt the system, when they will be sunk under ground. Each lamp will, it is promised, give a two thousand candle-power light, equal to about one hundred gas lamps.

The central station will be at No. 133, West 25th Street, where the Corliss engines and boiler which operate the electric generators have been placed. About twenty-five horse-power will be required for the twenty-two lamps, and one wire will convey the current to the entire series. It is promised that the light will be much cheaper than gas light of equal power. The success of the Brush system elsewhere reduces this experiment to a test of cost and the ability of the lamps to satisfy the requirements of the public eye.—*Scientific American.*

The American District Telegraph Company, in New York, have recently placed in a number of their offices telephones for public use. By means of this extension of facilities parties who wish to talk with subscribers of telephone exchanges in New York City, Brooklyn, Jersey City, Newark, Paterson, Elizabeth, Orange, Yonkers, and Coney Island, can do so under certain restrictions for five minutes, on paying a fee ranging from twenty to forty-five cents, according to distance. The next improvement will be the establishment of telephone stations, through which conversation may be had by appointment with non-subscribers.

In a paper read before the National Academy of Sciences, New York, Professor H. Morton gives the results of some experiments made by him on the electro-motive force of the Brush dynamo-electric machine.

These experiments show that each pair of coils on the armature of the machine develops a fluctuating electro-motive force, the projection of which gives a kind of oval curve around the centre of a diagram.

When these curves for each pair of coils are combined, it is found that they show a kind of eight-lobed figure with intersecting lines in certain places. These intersections, if compared with the positions of the commutator, are found to coincide exactly with the points at which rupture of circuit occurs, and thus show that each pair of coils is thrown out, not at the point where its force is least, but at that at which its electromotive force is equal to that from which it breaks; thus suppressing a spark, but only at a certain sacrifice of theoretical efficiency.

M. C. Naudin, from experiments in a field in the south of France, has been enabled to confirm the interesting conclusion of Grandeau, that plants which are sheltered from atmospheric electricity are in every respect superior to those grown in the open.

The first application in Glasgow of electricity to street lighting in a permanent form took place recently at the new *Herald* buildings in Buchanan Street. The proprietors have also contracted with Messrs. Anderson & Munro, electric engineers, Glasgow, to light up the public offices and the composing rooms of the *Herald* and the *Evening Times* by electricity. The Gramme machines are those used, driven by an Otto gas engine, supplied by Messrs. P. Watt & Sons—gas thus curiously so far superseding itself. This gas engine also works the cyclic elevator in use during the day. The electric lamps are those invented by Mr. Brockie, formerly of Glasgow.

The Compagnie Française du Télégraphie de Paris à New York announce that owing to the appearance of a fault in their cable, the nature of which has not yet been determined, it is considered advisable not to accept messages from the public for the present.

An application for a patent for the photophone was filed at Washington on the 28th of August, 1880, by Bell. The Patent Office *Gazette* of the 7th of December shows that the patent has been granted.—*Science.*

NEW DYNAMO MACHINES.—M. Heinrichs has completed the first of his new machines, and, we believe, has obtained very successful results with it. We hope to allude to them at greater length in an early issue. Mr. Gordon is experimenting with the machine he has recently patented, and will probably be able soon to exhibit some of the results obtained to his scientific friends. From one coil of this machine a light has been obtained sufficient to read newspaper type at a distance of fifty feet. No details as to the horse-power required have yet been ascertained, but the power necessary is thought to be very low.

Mr. Gordon's book on electricity has passed very successfully through its first edition, and a second is now to be published by Messrs. Sampson Low and Co.

We recently had an opportunity of trying the Hunning's transmitter with a Hickley telephone as receiver. By them speech was very perfectly rendered.

At the meeting of the Physical Society, to be held on the 22nd inst., the following communications will be made:—"On the measurement of small resistances," and, "On a method of comparing the capacities of two condensers," by R. T. Gazebrook.

A NEW USE FOR TELEGRAPH POLES.—An attempt to upset the Pullman Express was discovered on the night of the 12th inst., on the Midland Railway, near Appleby. A thick telegraph pole, which must have been placed on the rails purposely, was cut into three pieces by the night express.

THE LOSS OF THE "INDIAN CHIEF."—A correspondent writing to the *Daily Telegraph* says:—"In reading the account of the loss of the ship *Indian Chief* in your impression of to-day, it seems remarkable that, with all our engineering science and skill, telegraphy or telephony has not been established with our lighthouses and lightships. Had such been the case in the present instance, the Ramsgate lifeboat might have been on the scene possibly many hours earlier."

A telegram from Falmouth, of the 12th inst., states that the direct Spanish Telegraph Company's cable was on that date connected direct between Falmouth and Bilbao, and congratulatory telegrams were interchanged between the mayors of Falmouth and Bilbao, and Mr. Cox, the Falmouth postmaster, and Senor Mora, the central Spanish director of Madrid.

Large Telegraph Wires.—At the recent meeting of the American Electrical Society in Chicago, Col. C. H. Wilson read a paper on the use of large telegraph wires. He held that the employment of large gauge wires for the quadruplex circuit was an advantage. A No. 4 wire, recently laid between New York and St. Louis, was giving entire satisfaction. The question had been raised whether, in the desire to increase the conductivity of the wires, there was any limit to their size. There was a limit, and the conductivity could be increased by employing different conductors: copper instead of iron wire, for instance. In a discussion which followed, Mr. Somers advocated the use of large wires, and said that their employment had simplified the quadruplex problem.—*Scientific American.*

Phosphor Bronze Telegraph Wires.—M. E. Bède, formerly Professor at the Liége University, has recommended the use of phosphor bronze for wires instead of iron, phosphor bronze having four times the conductibility of iron, and being from three to four times as strong as steel. Aerial lines had the advantage of being easily inspected, but the disadvantage of being liable to accident, while underground lines were almost free from accident, but difficult of inspection. That inventor would render great service to telephonic communication who should devise a cheap method of constructing underground lines, that should at the same time permit of easy and complete inspection.—*Scientific American.*

"**The Telephone Suits.**"—If England shall now permit the telephone people to take in, transmit and deliver messages by means of the telephone, that action would result in competition fatal, or excessively damaging, to the Government's monopoly, a little whistle for which it paid fifty million dollars. But the whole business strikes the average free American intellect as the necessary outcome of a Government monopoly. It means that a monopoly must, in its own defence, prevent improvements; that it must immediately confiscate any valuable invention; that inventions must be discountenanced, even if not declared contraband, and that, as in the case of the telephone, when America sends them a good thing, it must be put where it will do the least good. All this proves that a Government monopoly can never give to the public the advantages furnished by private enterprise, acting under the spur of two or three lively competitors. Thus comments *The Operator* of New York.

Gray's Harmonic System.—A trial of this system took place in 195, Broadway, on December 21, five sides being worked on a Boston circuit. The operators were Messrs. Jackson, Cushing, Richardson, Wilcox, and A. Wright; 2,200 messages were exchanged in nine hours, a general average of 245 messages per hour, or 49 messages per hour to each man. Operator W. H. Jackson's average was 54. The business exchanged, however, was old messages that had previously been sent. The best average made of late on the quadruplex instruments was by Messrs. McLaren and Allen, the former exchanging 432, and the latter 414 in nine hours, being an average of 48 and 46 respectively per hour on regular business.—*The Operator.*

The United Telephone Company.—In our last issue we mentioned that an extraordinary meeting of this company had been called for the 13th inst. This was done at the requisition of the Right Honourable E. P. Bouverie, M.P., Colonel C. E. Webber, Viscount Anson, and W. P. Bouverie, Esq. At the meeting, Mr. Brand presiding, the Right Hon. E. P. Bouverie proposed and Viscount Anson seconded a resolution to the effect that the "Management of the company has been unsatisfactory." An amendment was then proposed, but not formally seconded that "The meeting, having heard the chairman's reply to the various charges made by a minority of the board, is of opinion that the shareholders should continue their confidence in the chairman and the majority of the board." A protracted discussion then ensued, and eventually, on the amendment being put, it was carried by 54 to 13, it being understood that the adoption of the amendment would involve the retirement from the board of those directors who had signed the requisition for the meeting. The original resolution was of course lost. The chairman then remarked that the majority of the directors had, without much solicitation on their part, received almost spontaneous offers to the extent of 29,997 votes, and so far as he could learn, the only support received by the requisitionists amounted to 2,225 votes. The meeting was then adjourned until the 27th inst., the proceedings closing with a hearty vote of thanks to the chairman.

New Patents—1880.

4782. "An improved method and apparatus for automatically counting the number of letters impressed with obliterating and other stamps." H. Ferguson and H. R. Kempe. Dated November 19.

4851. "Current meters." H. Law. Dated November 23.

5226. "Improvements in the art of transmitting telephonic messages, and in controlling the ground wires of the circuit station instruments from the main or central station, the apparatus and other mechanisms and appliances therefor, and their combination." A. M. Frankenberg. Dated December 14.

5237. "Improvements in machinery for braiding, lapping, or otherwise covering telegraph wires, crinoline steel, engine packing, or other cores, with textile or other material for insulating, protective, and other purposes." W. T. Glover and G. F. James. Dated December 14.

5268. "Improvements in the mode of, and apparatus for, transmitting drawings, characters, and writings by electricity; parts of which improvements are applicable to ordinary telegraphy." A. W. Reddie. (Communicated by J. André.) Dated December 15.

5275. "Improvements in, and relating to, means and apparatus for electric lighting; part of such improvements being applicable also to other purposes." D. G. FitzGerald. Dated December 16.

5319. "An improved alphabet or code system and means or apparatus for communicating intelligence by visible, audible, or other signals." A. M. Clark. (Communicated by C. G. Burke.) Dated December 18.

5340. "Telephone signal apparatus." W. Morgan-Brown. (Communicated by G. H. Bliss.) Dated December 20.

5352. "Dynamo-electric telegraphy." S. Pitt. (Communicated by O. Lugo.) Complete. Dated December 21.

5387. "Micro-transmitters." W. Johnson. Dated December 22.

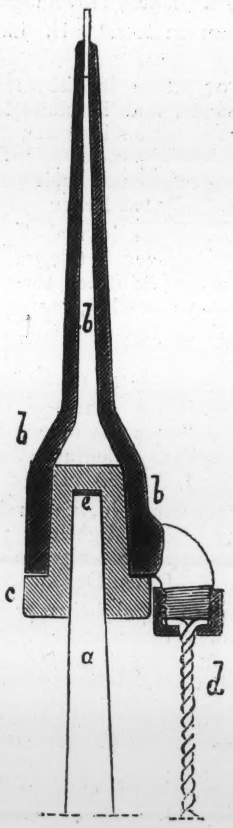
5414. "Improved alarm signal for doors, windows, or the like closures. A. C. Farrington. Dated December 23.

5482. "Improvements in, and connected with, telephonic apparatus." C. J. W. Wollaston. Dated December 30.

ABSTRACTS OF PUBLISHED SPECIFICATIONS, 1880.

2020.—"Continuous electrolytic action." CHARLES DENTON ABEL. (A communication from abroad by Leonhard Wollheim, of Vienna.) Dated May 18th. 2d. This invention has for its object to obtain from liquids that are subjected to electrolytic action the continuous separation of the non-metallic solid products of decomposition. For this purpose a long, narrow, but deep trough containing two plates forming the electrodes, of a size corresponding to that of the trough, has at one end near the top the inlet orifice for the liquid to be acted upon, while at the bottom of the other end it has two outlet apertures, one close to each electrode. The liquid to be acted on is made to flow in continuously through the inlet aperture, and in passing along between the two electrodes it is decomposed in proportion to the strength of the electric current. The metallic constituents are deposited upon the respective electrodes, while those non-metallic products that do not escape as gases descend to the bottom of the trough and escape through the outlet apertures. (*Provisional only.*)

2207. "Conductors of lightning." OTTO WOLFF. (A communication from William Michalk, of Deuben, Saxony.) Dated May 31st. 4d. The object of the invention is to avoid the damage which is caused to lightning-conductors when their points are only screwed on. *a* is the rod; *b*, the point; *c*, a non-conductor; *d*, the conducting wire; *e*, a supple, pliable body. Between rod, *a*, and point *b*, a non-conductor, *c*, is placed, whereby *c* is fitted on to or screwed on to *a* and *b* on to *c*.



2147. "Electric-light apparatus." WILLIAM LLOYD WISE. (A communication from abroad by Jacques Ambroise Mandon, of Paris.) Dated May 26th. 2d. This invention has for its object improvements in electric light apparatus, and relates particularly to a novel method whereby two pencils or carbons, each formed as an arc of a circle, are kept with their upper extremities or poles in proper relative positions, notwithstanding the consumption, wasting, or wear due to the action of the electric current producing the light. To this end each carbon or pencil is carried or supported and balanced by apparatus arranged so that in proportion as the carbon or pencil is consumed or reduced by the action of the electric current, the carbon or pencil will automatically move upward in a circular path about a centre coincident with that of the circle whereof the carbon or pencil represents an arc. (*Provisional only.*)

2235. "Apparatus for communicating between passengers and servants in railway trains." EDWARD GILBERT and ARTHUR EDWARD GILBERT. Dated June 1st. 4d. Relates to new or improved modes and means or apparatus for communicating by signals between the passengers in the carriages and the guard or other servants in railway trains, which apparatus is specially designed to be applied in combination with continuous pneumatic or vacuum brakes to allow passengers to apply these brakes and stop the motion of the train on the occurrence of danger or serious alarm; and the object of which is to render such signalling apparatus certain and efficient in its action, and most easily operated by any railway passenger. The invention consists essentially in using the power of the pneumatic pressure or vacuum which actuates the continuous brakes of a railway train to apply these brakes, and simultaneously cause the display of a semaphore or other visible signal to the guard or driver by the simple action of any passenger pulling a cord, or pushing or pulling a handle or lever in the carriage or compartment, to admit the air to, or allow it to escape from, the pneumatic tubes of the brake. (*Provisional only.*)

2236. "Electric lamp, &c." SIGISMUND COHNE. Dated June 1st. 2d. A cylinder is filled with water or other fluid, as oil, spirits, &c., in which is submerged a movable vessel. The vessel supports two double racks, affixed to a top and bottom crossbars, forming a parallelogram shaped frame, worked perpendicularly by pinions; the carbons are fixed in the crossbars so as to be brought opposite to each other, point to point. When the consumption of the candles commences the vessel ascends, the lower candle rises and the upper one descends in like ratio, and thus the candles are regulated automatically. (*Provisional only.*)

2252. "Electric lamps." GEORGE GUILLAUME ANDRE. Dated June 2nd. 6d. One or more lengths of carbons end for end, socketed or otherwise, are placed in a tubular holder, which supports them throughout their length, and wherein they can slide as required. The holder has a longitudinal slot, wherein works a peg projecting from a sliding sleeve suspended by a cord which passes over a pulley, and has a weight attached to its end. The weight may slide on a guide rod or rods, which may be used for connecting the current. Fig. 1 is a side view, and fig. 2 a part sectional side elevation of a lamp constructed according to this invention. A is the socket fuse plate of the lamp proper, into which the ring for the glass globe or cylinder is screwed; A^1 is a central socket part, to which is screwed the cylindrical tube, A^2, to the top of which the arm or holder, C, for the negative electrode, C^2, is screwed. This electrode is free to slide lightly through a lantern boss on the arm, C, and is fitted with a copper plug, *c*. c^1 is a contact arm passing through a socket in the plate, *a*, with a light contact spring, L^3, at its upper end. At its lower end it passes through a wire coil of high resistance, and terminates in a terminal for carrying off the negative current; one end of this coil wire is connected to the plate, A, and the other end to the terminal, L^1. D^1 is the holder for the carbon or carbons; it is made of any desired length, the carbon being placed therein end for end, and fitting easily therein. The carbon holder, D^1, is removable, and will, when its carbons are consumed, be replaced by a holder filled with carbons. It is fixed in the cylinder, G, which by a T piece, G^1, or other bar, is connected to or carried down to the floor or base of the lamp standard. The cylinder, G, is in a tube, H, which, by means of plaster of Paris or other non-conducting cement, is fixed in and insulated from the socket, A^2. K, K, are contacts joined to the nipple, H^1, which is screwed into the top of the tube, H. The holder, D^1, has a longitudinal slot, as shown, wherein works the peg, E, carrying the carbon or carbons. This peg projects from the connecting sleeve, E^1, on the endless cord, band, or wire, F, passing round the upper pulley, F^1, and the lower pulley, F^2, (or the cord may, as stated, pass over an upper pulley only, and have the weight suspended from one end, the other end being attached to a guided sleeve with a projecting peg. I is a brake pulley on the spindle of the lower pulley, F^2, with band, I^1, one end of which is fastened to the bar, M, which is fixed to the stand, M^1. The other end of the band is connected to the end of a lever, N, which has its fulcrum in the stand, M^1, and at the other end carries the soft iron core, O, of the solenoid, O^1. The latter is wound with two coils of same resistance, but wound in opposite directions. One coil is by wire to the terminal, L, connected to the arm, C, and the other by wire to the terminal, L^1, connected to the contact arm, C^1. When the carbon point is in its normal position the two currents neutralise each other in the solenoid, but when the contact with spring, L^3 is broken the whole current passes through one of the coils of the solenoid, the core O is raised, the brake band, I^1, is thereby let go, and the brake pulley, I, released, whereupon the weight will move the cord F and raise the carbon. When the contact is then restored at L^3 the core, O, drops and puts on the brake. Obviously the arrangement may be reversed, and the brake be put on when the contact is broken. The high resistance coil on the lower end of arm C^1 forming connection with the plate, A, is for the purpose of providing a circuit for the extra current occasioned by the break of contact at L^2 to prevent the formation of sparks there. K^1 is the positive terminal on the lower end of the tube, H. *b* is a small hole for automatic air ventilation when the lamp is extinguished.

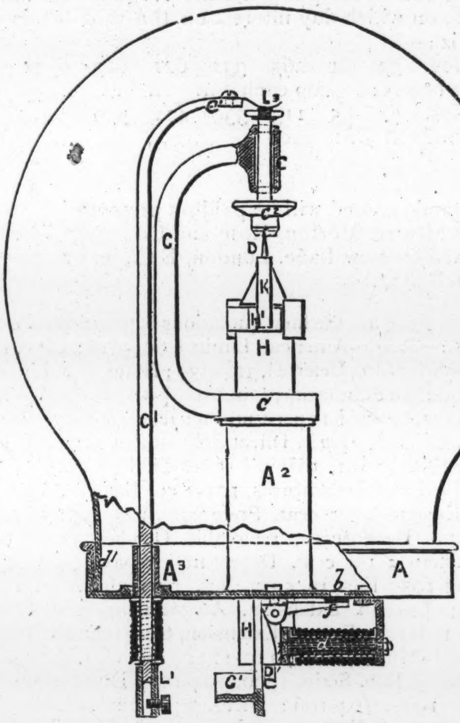


FIG. 1.

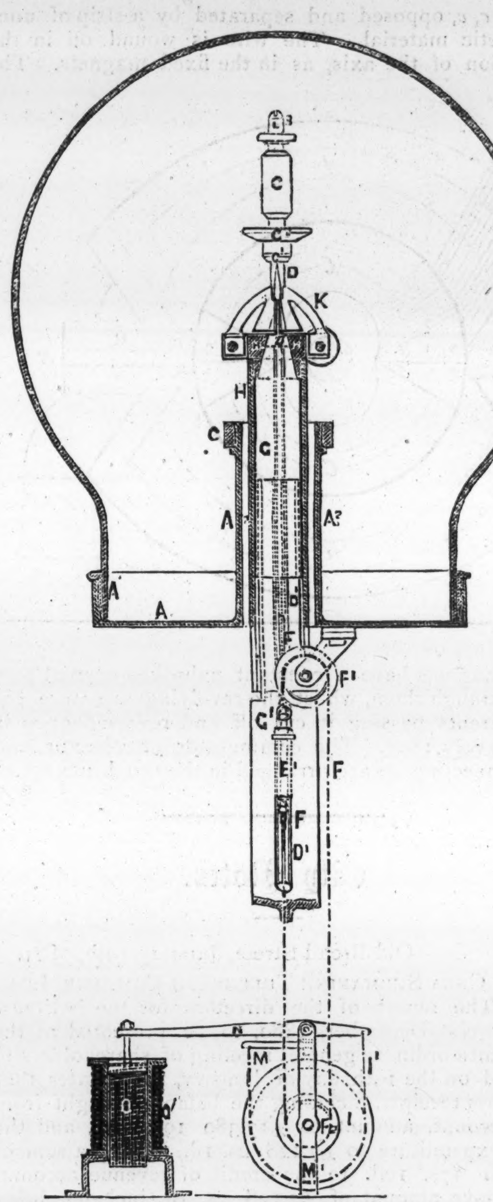
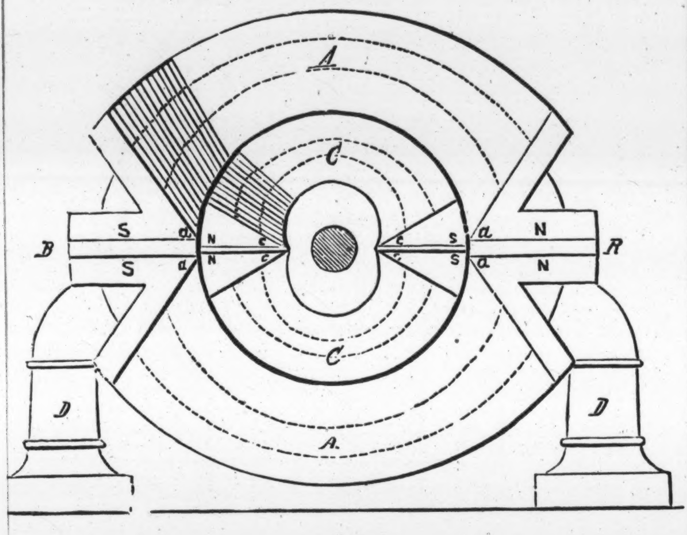


FIG. 2.

2272. "Obtaining, increasing, and employing currents of electricity, &c." THOMAS SLATER. Dated June 3rd. 6d. Relates to improvements in obtaining, increasing, and employing currents of electricity, and in apparatus therefor. The fig. 2 is an end elevation of a dynamo-electric machine constructed according to the invention. A, A, are the fixed electro magnets having their like poles, *a*, *a*, opposed and separated by a strip, B, of non-magnetic material. Each magnet surrounds one half the circumference of the revolving armature, C, and the poles are each brought to a line (as shown) where opposed to the revolving armature. The wire is wound in the direction of the axis of the revolving armature. These fixed magnets are supported by pillars, D, D. The revolving armature, C, is composed of two similar electro-magnets with their like poles, *c*, *c*, opposed and separated by a strip of non-magnetic material. The wire is wound on in the direction of the axis, as in the fixed magnets. The fixed magnets have a constant unbroken current passing through them, whilst the revolving armature has the currents passing it cut off and reversed once in about every 180°. The commutator or collector, and the connecting up are arranged in the usual manner.



City Notes.

Old Broad Street, January 12th, 1881.

THE CUBA SUBMARINE TELEGRAPH COMPANY, LIMITED.—The report of the directors for the half-year ending 31st December, 1880, to be presented at the nineteenth ordinary general meeting of shareholders to be held on the 19th day of January, 1881, states that the gross receipts, including the balance brought from last account, amount to £17,389 19s. 11d., and the gross expenditure to £7,128 2s. 1d., leaving a sum of £10,261 17s. 10d. to the credit of revenue account. The above amount of £7,128 2s. 1d. includes, however, the sum of £3,379 7s. 9d., expended in the attempt to repair the Cienfuegos-Santiago section of the original cable, which the shareholders will recollect broke down in March last, the ordinary expenses (£3,748 14s. 4d.) being about the same as usual. The directors regret to report that the attempt to repair this section has been unsuccessful owing to the cable east of Cape Cruz being in such bad condition as to render it almost necessary to renew the whole of that portion. In order to avoid this great expense, and finding that other parts of this section are not in altogether a satisfactory condition, the directors have entered into a contract by which Messrs. Hooper, of Hooper's Telegraph Works, are to lay and maintain another cable between Cienfuegos and Santiago, on terms which the directors consider will be advantageous to the company. After placing £2,500 to the reserve fund, increasing that fund to £35,365 5s. 8d., and providing for the dividend on the preference shares, a balance of £4,761 17s. 10d. remains, out of which the directors recommend the payment of a dividend on the ordinary shares at the rate of 5 per cent. per annum, free of income tax, leaving the sum of £761 17s. 10d. to be carried forward to the current half-year's account. It will be seen from the accompanying comparative statement of traffic that the interruptions to several of the cables of our allies, the West India and Panama Company, have been more protracted than usual during the past half-year, which accounts for the great falling off in the traffic.

THE Union Trust Company of New York have given notice that, in accordance with the provisions of the Deed of Trust excecuted by the Western Union Telegraph Company under date of February 1st, 1875, to the Union Trust Company of New York as trustee, the following number bonds were drawn by lot on the 5th inst. for redemption on the 1st day of March proximo, on which day interest on the said bonds will cease, viz:—

Nos. 53 64 265 331 621 623 654	
Seven bonds at £200 each	£1,400
Nos. 71 95 113 339 471 539	
Six bonds at £100 each	600
	£2,000

The bonds named will be paid on presentation at the office of Messrs. Morton, Rose and Co., agents for the loan, Bartholomew Lane, London, E.C., on or after the 1st March next.

The following are the final quotations of telegraphs for the 12th inst.:—Anglo-American Limited, 60¾-61¼; Ditto, Preferred, 88-89; Ditto, Deferred, 32¾-33¼; Black Sea, Limited, ——; Brazilian Submarine, Limited, 9¾-10; Cuba, Limited, 8¾-9¼; Cuba, Limited, 10 per cent. Preference, 16¾-17¼; Direct Spanish, Limited, 2⅞-3⅛; Direct Spanish, 10 per cent. Preference, 12¼-12¾; Direct United States Cable, Limited, 1877, 11-11¼; Scrip of Debentures, 101-103; Eastern, Limited, 9¾-10; Eastern 6 per cent. Preference, 12⅝-12⅞; Eastern, 6 per cent. Debentures, repayable October, 1883, 102-106; Eastern 5 per cent. Debentures, repayable August, 1887, 102-105; Eastern, 5 per cent., repayable Aug., 1899, 104-107; Eastern Extension, Australasian and China, Limited, 10¼-10½; Eastern Extension, 6 per cent. Debenture, repayable February, 1891, 110-113; 5 per cent. Australian Gov. Subsidy Deb. Scrip, 1900, 104-106; Ditto, registered, repayable 1900, 104-106; Ditto, 5 per cent. Debenture, 1890, 102-104; Eastern and South African, Limited, 5 per cent. Mortgage Debentures, redeemable 1900, 101-103; Ditto, ditto, to bearer, 101-103; German Union Telegraph and Trust, 10¼-10¾; Globe Telegraph and Trust, Limited, 6⅜-6⅝; Globe, 6 per cent. Preference, 11⅞-12⅛; Great Northern, 10¾-11; Indo-European, Limited, 25½-26½; London Platino-Brazilian, Limited, 5¾-6¼; Mediterranean Extension, Limited, 2¾-3¼; Mediterranean Extension, 8 per cent. Preference, 10¾-11¼; Reuter's Limited, 10¾-11¼; Submarine, 263-268; Submarine Scrip, 2½-2¾; West Coast of America, Limited, 3¼-3½; West India and Panama, Limited, 1¾-2; Ditto, 6 per cent. First Preference, 6¾-7¼; Ditto, ditto, Second Preference, 6-6½; Western and Brazilian, Limited, 7⅞-8⅛; Ditto, 6 per cent. Debentures "A," 106-110; Ditto, ditto, ditto, "B," 98-101; Western Union of U. S. 7 per cent., 1 Mortgage (Building) Bonds, 120-125; Ditto, 6 per cent. Sterling Bonds, 104-107; Telegraph Construction and Maintenance, Limited, 35½-36; Ditto, 6 per cent. Bonds, 103-106; Ditto, Second Bonus Trust Certificates, 3½-3¾; India Rubber Company, 17½-18; Ditto, 6 per cent. Debenture, 106-108.

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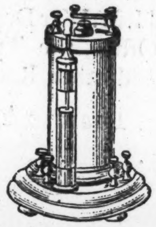

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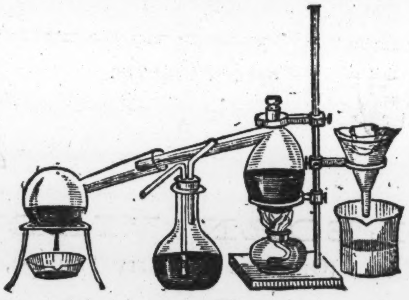

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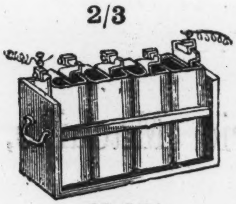

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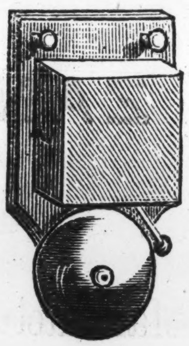

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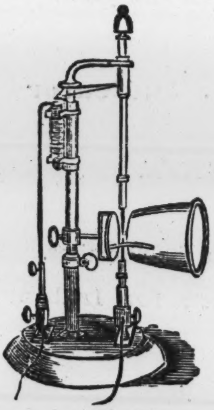

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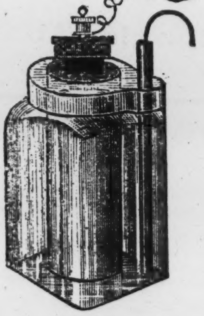

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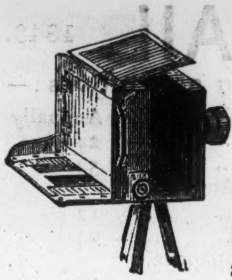

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